REMARKS

I have amended the Specification to change every instance of "3kHZ to 300Ghz" to -- 3Ghz to 3000Ghz -- in order to correspond to claims 17 and 22.

In addition, I have incorporated the phrases "using microwave radiation" and "optical contacted" to additional amendments to the Specification as suggested by Examiner, in order to clarify the invention's written description and bring it into conformity with the claim language.

CLAIM OBJECTIONS

In claim 45 as per Examiner's suggestion, I have changed "shaped" to -- shape -- and change "center to the plastic" to --center of the plastic --.

Claims 31-32 (cancelled).

Claims 1-14 and 34 (withdrawn).

CLAIM REJECTIONS - 35 USC § 112, SECOND PARAGRAPH

Claims 15,17,18,36, and 40-42 stand rejected under 35 USC § 112, second paragraph as failing to particularly point out and distinctly claim the invention's subject matter. In regards to a plastic, annelation does not mean to toughen by heat, as it does when this term is applied to a metal or a glass. Instead, as applied to plastics, it is a term of art that means to use heat to relieve a plastic's internal stresses, (please see http://www.marandex.com/glossary/ of terms, **Anneal**: To prevent the formation of or remove stresses in plastic parts by controlled cooling from a suitable elevated temperature; or see http://www.sctech.com/c300.html, fourth paragraph, **Note:** Some plastic substrates occasionally contain internal stresses which can cause cracks or crazing during fabrication. In such cases, it may be necessary to anneal the plastic before fabrication). Thus, the annelation effect of heating a plastic during the present invention's optical contacting process would be clear to one skilled in the art.

Plastic (from Encarta dictionary):

1., able to be molded: able to be shaped, molded, or modeled.

2., physics, able to have shape permanently changed: able to be bent, stretched, squeezed, or pulled out so that the resulting change of shape is permanent.

That it is the plastic that is being annealed is perhaps more clearly expressed in my rejected June 10, 2002 version of claim 26:

26. (Amended) **A method of reducing curvature distortions in a plastic** comprising:

forming a glass to a particular shape having a center and a margin;

forming a plastic to a particular shape having a margin and a center and wherein the shape is essentially adapted to receive the shape of the formed glass;

applying microwave radiation **for a time effective to anneal the formed plastic** whereby the shape of the formed glass and the shape of the formed plastic remain substantially unchanged; and

removing the formed plastic from the glass.

I have amended claims 15 and 40 to reflect the inherent annelation-of-plastic effect of the present invention.

CLAIM REJECTIONS - 35 USC § 112, FIRST PARAGRAPH

Claims 15,17,18,36, and 40-42 stand rejected under 35 USC § 112, first paragraph as failing to comply with the written description requirement.

Glass has the finest optics of all materials known today (please see Background, last paragraph), thus the more glass-like a plastic is made the better its optical nature becomes. Polycarbonate, a plastic, due its inherent toughness, in particular has poor optics because it must be manufactured by high strength compression molding. Such compression leaves compression waves in the plastic, resulting in optical abberations known to those skilled in the art.

In the present invention, the heat given off by the adjacent, rigid microwave- absorbing glass template relaxes the internal compression-induced stresses of the plastic, conforming the curvature of the plastic to the adjacent, rigid, optically perfect glass curvature via a closeness inherent in the optical contacting process. The end result, which I wish to claim, is a "glass-like" improvement in the plastic's optics.

Therefore, from the Summary of Specification, third from last paragraph, "It is a characteristic of the present invention to provide a method to provide **glass-like optical characteristics to plastic** by bonding the plastic to a **rigid** glass surface." and, from the Field of the Invention, second line, "more particularly, the present invention provides a **method for producing an optically correct** composite" , I have amended claims 15 and 40 to reflect that the present invention optically corrects optical imperfections in the plastic during the optical contacting bonding process.

In order to comply with the written description requirement of 35 USC § 112, first paragraph, I have amended the Specification to provide support for these claim changes. In addition, I have incorporated the Specification changes previously submitted in my June 30, 2003 response which were not entered due to their noncompliance with revised 37 CFR 1.121 . Applicant submits that, with the above changes, claims 15 and 40 now conform to what is reasonably disclosed in the Specification to one skilled in the art.

These changes to the Specification to include:

The present invention also includes a method of forming a glass and plastic composite using optical contacting to hold the glass and plastic portions together using microwave radiation, Summary, line 12.

The present invention also includes a method of enhancing the kinetic reaction strength of a sealant using microwave radiation, Summary, line 12.

Optical contacting means to adhere two surfaces together through molecular attraction without the use of an adhesive, Detailed Description of the Invention, line 7.

Optically correcting means to correct optical imperfections, Detailed Description of the Invention, line 7.

Anneal means to use heat to relieve a plastic's internal stresses, Detailed Description of the Invention, line 7.

Plastic means the physical characteristic of being able to be shaped, molded, or modeled such that the resulting change of shape is permanent, Detailed Description of the Invention, line 7.

It is a characteristic of the present invention to provide a method of optically contacting together the glass and the plastic during the bonding process of forming the resultant optical composite using microwave radiation, page 4, line 27, end of Summary.

It is a characteristic of the present invention to provide a method of enhancing the kinetic reaction strength of a sealant using microwave radiation, page 4, line 27, end of Summary.

In another preferred embodiment, the core is made of glass and the polymer cladding is optically contacted on to the optic fiber using heat generated from microwave radiation, page 5, line 4,third

from last paragraph of Detailed Description of the Invention.

The present invention also includes a method of annealing plastic by heating the plastic indirectly using microwave radiation while the plastic rests on a rigid, microwave-absorbing glass surface, twelve line of Summary, page 2, line 18.

SUBSTITUTE SPECIFICATION, MARKED UP VERSION

SUMMARY

In accordance with the present invention, methods and a composition are provided for producing an optical composite with the optical clarity and scratch-resistance of a glass and the tensile strength of a polymer. In addition, the present invention also provides an optical composite with the optical clarity of a glass, yet protected by the tensile strength of a polymer.

The present invention includes a glass and polymer composite composed of a glass having a shape, a center, a margin; the plastic has a center, a shape adapted to receive the shape of the glass, and a margin; a sealant is disposed between the margin of the glass and the margin of the plastic, whereby the central portions of the glass and the plastic are devoid of the sealant.

The present invention includes having the glass contain metallic compounds selected from the group consisting of silver salts, copper salts gold, palladium, cadmium chalcogenides, noble metal colloids, and ferrites.

<u>The present invention also includes a method of annealing plastic by heating the plastic indirectly using microwave radiation while the plastic rests on a rigid, microwave-absorbing glass surface.</u>

<u>The present invention also includes a method of forming a glass and plastic composite using optical contacting to hold the glass and plastic portions together using microwave radiation.</u>

<u>The present invention also includes a method of enhancing the kinetic reaction strength of</u>

a sealant using microwave radiation.

The present invention also includes having the glass be photochromic.

The present invention also includes having the plastic, in whole or in part, be selected from the group consisting of polycarbonate, polyurethane, polystyrene, fluorocarbon and polymethylmethacrylate.

The present invention also includes having the sealant be selected from the group consisting of silicones, shellac and lacquer, silane coupling agents, disilyl crosslinker compounds, epoxy resins, crosslinkable polyethylene vinylacetate terpolymer, polyvinyl butyral and polysulfide.

The present invention also includes having the glass and plastic be transparent and refractive.

The present invention also includes having the margin of the glass having at least one appendage and the margin of the plastic defining an aperture shaped for receiving the appendage of the glass.

The present invention also includes having the margin of the plastic having at least one appendage and the margin of the plastic defining an aperture shaped for receiving the appendage of the plastic.

The present invention also includes having the percentage of glass in the composite be between about 0.01 to 99.99 %.

The present invention also includes having a microwave-transparent spring-loaded vice

adapted to hold together the glass and the plastic.

The present invention also includes having a vice whose spring tension is between about 0.01 to 200 foot pounds.

The present invention also includes having a weighted microwave-transparent, vice adapted to hold together the glass and the plastic.

The present invention also includes having a vice whose holding weight is between about 0.01 to 100 pounds.

The present invention also includes a method of forming a glass and plastic composite by forming a glass having a margin and a center to a particular shape; then forming a plastic having a margin and a center to a shape essentially adapted to receive the shape of the glass; then applying sealant only to the margin of the glass and the margin of the plastic, whereby the center of the glass and the center of the plastic are devoid of the sealant; then placing together the glass and the plastic; then placing the glass and plastic into a vacuum chamber; then applying vacuum pressure to the glass and the plastic; then placing the vacuum chamber into a microwave oven; and then finally, applying microwave radiation to the glass and the plastic for an effective time.

The present invention also includes a method of forming a glass and plastic composite using an applied vacuum pressure of between about 0.01 to 200 torr.

The present invention also includes a method of forming a glass and plastic composite using microwave radiation applied at between about 10 watts to 100,000 watts and a frequency of between about [3kHZ to 300Ghz] <u>3Ghz to 3000Ghz</u>.

The present invention also includes a method of forming a glass and plastic composite using microwave radiation that is applied for between about 0.01 to 100 minutes.

The present invention also includes a method of forming a glass and plastic composite by forming a glass having a center and a margin to a particular shape; then forming a plastic having a margin and a center to a shape essentially adapted to receive the shape of the glass; then applying sealant only to the margin of the glass and the margin of the plastic, whereby the center of the glass and the center of the plastic are devoid of the sealant; then applying force to the glass and plastic by placing the glass and plastic into a microwave-transparent vice adapted to hold together a glass and plastic composite using microwave radiation that is applied for between about 0.01 to 100 minutes.

The present invention also includes a method of forming a glass and plastic composite using microwave radiation wherein the microwave radiation is applied at between about 10 to 100,000 watts and at a frequency of between about [3kHZ to 300Ghz] 3Ghz to 3000Ghz.

The present invention also includes a method of forming a glass and plastic composite using microwave radiation where sealant is applied to the glass and the plastic before the glass and the plastic are placed together and an effective amount of distilled water is applied to the center of the glass and the center of the plastic before applying the microwave radiation.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic before the glass and the plastic are placed together, that uses gravity to hold the glass and the plastic together.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic before the glass and the plastic are placed together, that uses spring tension to hold the glass and the plastic together. .

The present invention also includes a method of forming a glass and plastic composite by forming a glass having a center and a margin to particular shape; then forming a plastic having a margin and a center to a shape essentially adapted to receive the shape of the glass; then applying force to the glass and plastic by placing the glass and plastic into a microwave-transparent vice adapted to hold together the shape of the glass and the shape of the plastic; then placing the glass and plastic into a vacuum chamber; then applying vacuum pressure to the glass and the plastic; then placing the vacuum chamber into a microwave oven; then applying microwave radiation to the glass and the plastic; then applying sealant only to the margin of the glass and the margin of the plastic, whereby the center of the glass and the center of the plastic are devoid of the sealant; and finally, applying microwave radiation to the glass and the plastic for an effective time.

The present invention also includes a method of forming a glass and plastic composite, that uses gravity to hold the glass and the plastic together, where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and before applying microwave radiation to the glass and the plastic.

The present invention also includes a method of forming a glass and plastic composite, that uses spring tension to hold the glass and the plastic together, where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and before applying

microwave radiation to the glass and the plastic.

The present invention also includes a method of forming a glass and plastic composite using microwave radiation where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and an effective amount of distilled water is applied to the center of the glass and the center of the plastic before applying the microwave radiation.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and before applying microwave radiation to the glass and the plastic, where vacuum pressure is applied for between about 0.01 to 200 torr.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and before applying microwave radiation to the glass and the plastic, where the microwave radiation is applied for between about 0.01 to 100 minutes.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic after the glass and the plastic are placed together and before applying microwave radiation to the glass and the plastic, where the microwave radiation is applied for between about 10 to 100,000 watts and a frequency of between about [3kHZ to 300Ghz] <u>3Ghz to 3000Ghz</u>.

The present invention also includes a method of forming a glass and plastic composite, where sealant is applied to the glass and the plastic after the glass and the plastic are placed

together and before applying microwave radiation to the glass and the plastic, where the microwave radiation is applied for between about 0.01 minutes to 100 minutes.

The present invention also includes a glass and plastic composite formed by joining a glass having a margin and a center and a particular shape to a plastic having a margin and a center to a shape essentially adapted to receive the shape of the glass; then applying sealant only to the margin of the glass and the margin of the plastic, whereby the center of the glass and the center of the plastic are devoid of the sealant; then placing together the glass and the plastic; then placing the glass and plastic into a vacuum chamber; then applying vacuum pressure to the glass and the plastic; then placing the vacuum chamber into a microwave oven; and then finally, applying microwave radiation to the glass and the plastic for an effective time.

It is a characteristic of the present invention to provide a method of bonding together glass and plastic, while maintaining their original optical clarity.

It is a characteristic of the present invention to provide method to prevent plastic from becoming scratched by protecting it with a layer of glass.

It is a characteristic of the present invention to provide a method to prevent glass from becoming damaged by protecting it with a layer of plastic.

It is a characteristic of the present invention to provide a method to provide glass-like optical characteristics to plastic by bonding the plastic to a rigid glass surface.

It is a characteristic of the present invention to provide method of making a glass and plastic composite that is photochromic and capable of being performed by optical labs of diverse

size.

It is a characteristic of the present invention to provide a method of differentially heating the glass and the plastic during the bonding process of forming the resultant optical composite.

It is a characteristic of the present invention to provide a method of optically contacting together the glass and the plastic during the bonding process of forming the resultant optical composite using microwave radiation.

DETAILED DESCRIPTION OF THE INVENTION

The description of the present invention is organized as follows: a general description, including a description of operation of one embodiment is described, then alternative embodiments are described.

The optical composite is composed of at least one piece of glass and one piece of plastic. The glass is a microwave absorbent glass. The plastic is heated indirectly by heat transmitted to it by the adjacent microwave-heated the glass portion. The glass and plastic's margins are then sealed together with a sealant.

Optical contacting means to adhere two surfaces together through molecular attraction without the use of an adhesive.

Optically correcting means to correct optical imperfections.

Anneal means to use heat to relieve a plastic's internal stresses.

Plastic means the physical characteristic of being able to be shaped, molded, or modeled such that the resulting change of shape is permanent.

Glass means an amorphous, vitreous substance that has a disordered molecular arrangement, but is mechanically rigid and capable of transmitting light.

The glass can include silver salts, copper salts gold, palladium, cadmium chalcogenides, noble metal colloids, and ferrites.

The plastic can include, in whole or in part, polycarbonates, polyurethanes, polystyrenes, fluorocarbons and polymethylmethacrylates.

The sealant can include, in whole or in part, silicones, shellac, lacquer, epoxy, silane coupling agents, disilyl crosslinker compounds, epoxy resins, crosslinkable polyethylene vinylacetate terpolymer, polyvinyl butyral, polysulfide, and commercially available, crosslinkable polyethylene vinylacetate terpolymer.

The most preferred silane coupling agents are those which are commercially available and which are recognized by those skilled in the art as being effective coupling agents. In particular, silane coupling agents include N-(2-aminoethyl)-3-aminopropyltrimethoxysilane, 3[2(vinylbenzylamino) ethylamino]propyltrimethoxysilane, 3-methacryloxypropyltrimethoxysilane, 3- glycidoxypropyltrimethoxysilane, triacetoxyvinylsilane, tris-(2-methoxyethoxy) vinylsilane, 3-chloropropyltrimethoxysilane, 3-aminopropyltrimethoxysilane, vinyltrimethoxysilane, mercaptopropyltrimethoxysilane, mercaptopropyltriethoxysilane and the azide functional silanes of

the formula X3 SiR'''SO2N3, where X denotes a hydrolyzable group such as an alkoxy, an alkylalkoxy or a chloro radical, and R''' denotes a divalent organic radical.

The syntheses of the disilyl crosslinker compounds are known in the art. The disilylalkyl compounds can be synthesized by reacting choloralkytrialkoxysilane with tetraalkoxysilane (represented by the formula SiX4 where X is an alkoxy group) in the presence of lithium. The bis(trimethoxysilyl)benzene compounds can be synthesized by reducing bis(trichlorosilyl)benzene with lithium aluminum halide followed by methanolysis as described in Preparation and Characterization of Disilylbenzene and Bis(trimethoxysilyl)benzene, Bilow, et al., J. Org. Chem. 26(3) 929, 1961. The disilyl crosslinker can also be synthesized by any of the means taught in U.S. Pat. No. 3,179,612, especially, by the method taught in Example 2 of said patent. The disilyl crosslinker compounds can also be synthesized by reacting polyamines with chloroalkylsilanes according to the method taught in U.S. Pat. No.4,448,694.

In a preferred embodiment, the glass contains silver salts, copper salts gold, palladium, cadmium chalcogenides, noble metal colloids, and ferrites. The glass and the plastic are placed in a vacuum while microwave radiation is applied to the resulting optical composite. After removal from the microwave radiation, and while still held in a microwave-transparent vice, a sealant is applied to the margins of the glass and the plastic at their junction. The glass and plastic may each be refractive. The glass percentage of the composite is between about 0.01% to 99.99%. The plastic percentage of the composite is between about 0.01% to 99.99%. The glass and plastic each range from being opaque to being transparent.

The vice can include conventional glasses, conventional plastics, and conventional natural and synthetic rubbers.

The microwave-transparent materials can include conventional glasses, conventional plastics, and conventional natural and synthetic rubbers.

Photochromic means a visible and reversible change in light transmission or color that is induced by exposure of the material to electromagnetic radiation.

Refractive means that the material is capable of bending a particular wavelength of light.

Opaque means not transmitting a particular wavelength of light.

Transparent means transmitting at least 99.99% of a particular wavelength of light.

Microwave-transparent means that not absorbing microwave radiation.

In another preferred embodiment, distilled water is placed between the glass and the plastic before microwave radiation is applied.

In another preferred embodiment, the optic fiber is made up of 3 to 4 parts: a central core made of silicon dioxide glass, though other glasses may also be used, for transmitting the optical signals; surrounding the core is a cladding; a buffer coating in turn surrounds the cladding; and an optional final coat, the sheath surrounds the buffer.

Cladding means a thin layer of glass, plastic, or polymer coating with an index of refraction lower than the core, surrounding the core. The function of the cladding is to reflect light back into the core as it moves down the fiber. The cladding may be multi-layered. These cladding layers may be of different indices of refraction. Claddings are usually silica, but other

glasses, silicone, and other polymers may be used; however, the refractive index must be lower than the core to allow light to propagate through the fiber.

The buffer coating is a plastic or a polymer that protects the core and cladding from moisture, scratches, and other contamination while imparting additional strength to the fiber.

The sheath is an optional final coating made of metal, plastic or a polymer and provides additional strength, stiffness, protection and resistance to moisture.

In one preferred embodiment, the core is made of glass and polymer cladding is bonded on to the optic fiber using heat generated from microwave radiation absorbed by the optic fiber.

In another preferred embodiment, the core is made of glass and the polymer cladding is optically contacted on to the optic fiber using heat generated from microwave radiation.

In another preferred embodiment, the core is made of glass and a polymer sheath is bonded on to the optic fiber using heat generated from microwave radiation absorbed by the optic fiber.

In another preferred embodiment, the core is made of glass and a buffer coating is bonded on to the optic fiber using heat generated from microwave radiation absorbed by the optic fiber.

While a few presently preferred embodiments of the invention are shown and described, it will be apparent to those skilled in the art that various changes and modifications, such as substituting ultraviolet radiation and ultraviolet absorbing compounds for the present invention's microwave radiation and microwave absorbing compounds, may be made therein without departing from the spirit of the invention or from the scope of the appended claims.